

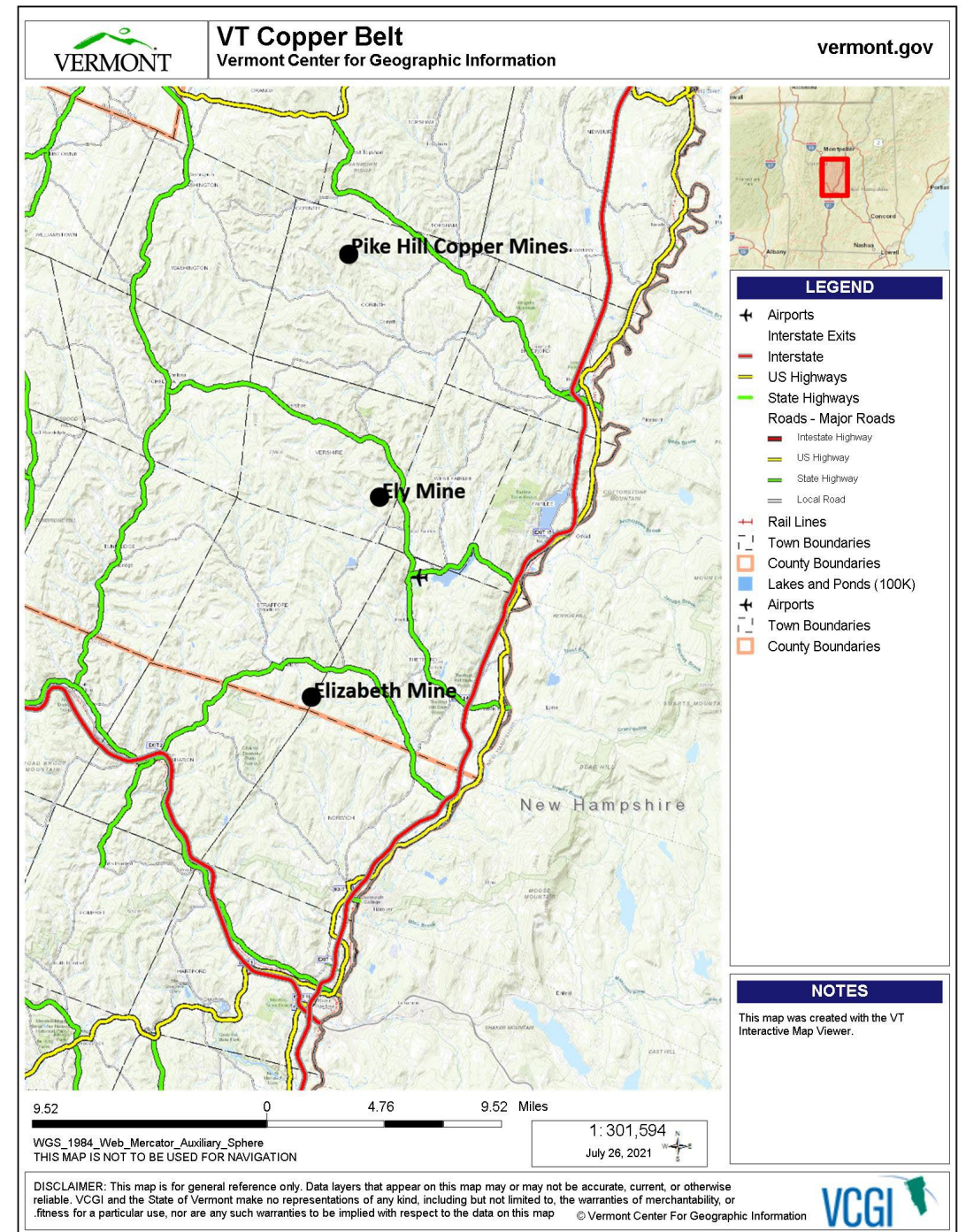
# Pike Hill Copper Mine Superfund Site Information Update - January 2022





# Pike Hill Copper Mine

- The Pike Hill Copper Mine Superfund Site (Site) is located in the Town of Corinth, Orange County, Vermont.
- The Site includes three separate mines: Union, Eureka, and Smith mines.
- The Site was placed on the EPA National Priorities List (NPL), also known as the Superfund list, in 2004.
- The Site is considered eligible for the National Register of Historic Places triggering the requirements of the National Historic Preservation Act.
- The Site hosts the largest known concentration of state-threatened eastern small-footed bats in Vermont and is historic habitat for the federally threatened Northern Long-Eared Bat.

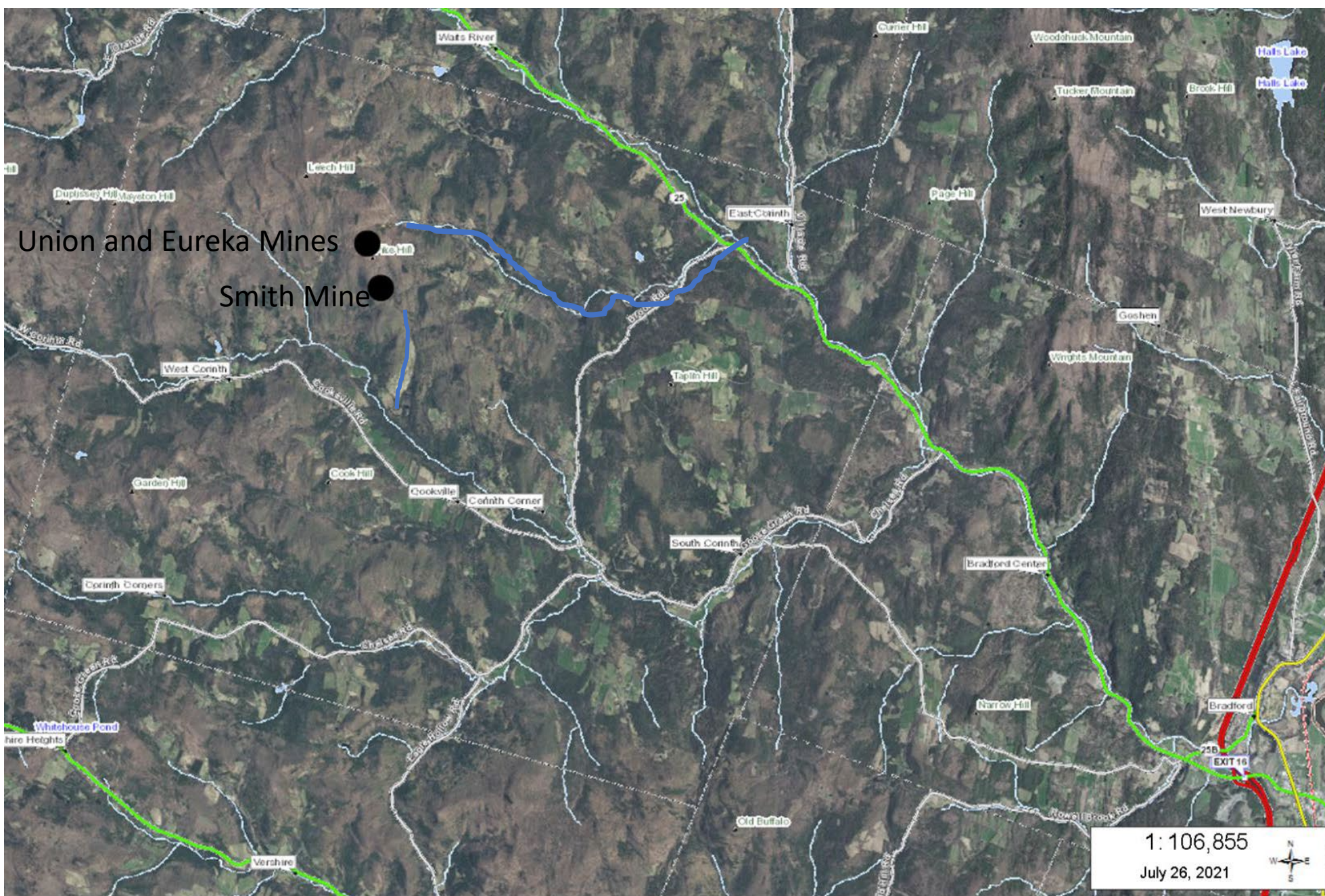


## Pike Hill Copper Mine Superfund Site Operational History

- One of three major copper mining sites that operated in the 20-mile-long Orange County, VT, “Copper Belt” during the nineteenth and twentieth centuries along with Elizabeth Mine and Ely Copper Mine.
- Active mining during intermittent periods from 1846 – 1919.
- Ore shipped to Ely Mine smelter from 1878 – 1882 and to Elizabeth Mine flotation mill in late 1940’s and early 1950’s.
- 4,300 tons of copper production.
- 6% of Vermont total copper production.
- Several of the former owner/operators are the same as Elizabeth Mine and Ely Copper Mine and no longer exist.







Union and Eureka Mines ●  
Smith Mine ●

## LEGEND

- ✈ Airports
- Roads - Major Roads
  - Interstate Highway
  - US Highway
  - State Highway
  - Local Road
- Rail Lines
- Town Boundaries
- County Boundaries



## NOTES

This map was created with the VT Interactive Map Viewer.



1:106,855  
July 26, 2021

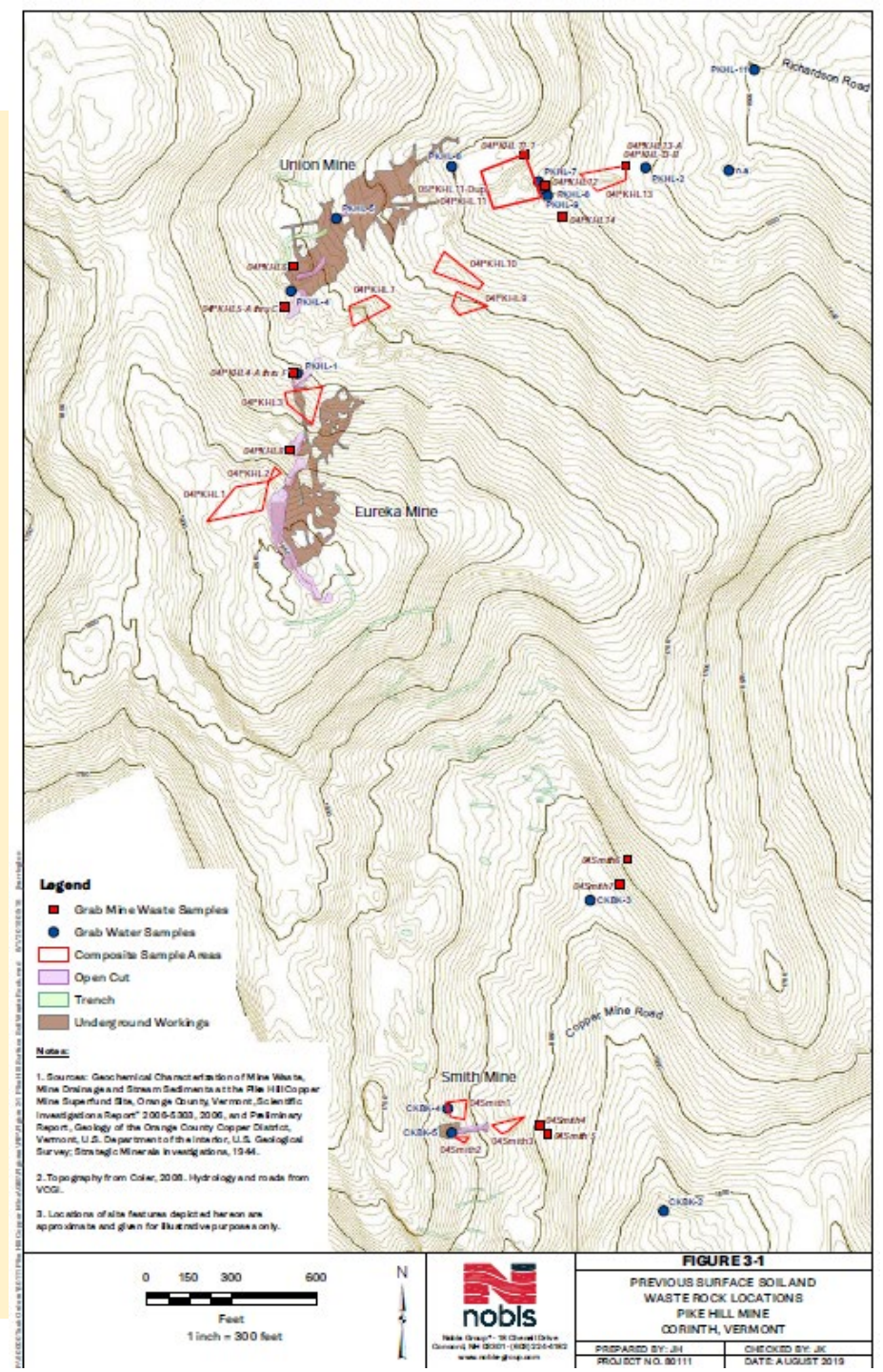
A north arrow pointing towards the top of the map, with labels for North (N), South (S), East (E), and West (W).

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. VCGI and the State of Vermont make no representations of any kind, including but not



# Pike Hill Copper Mine

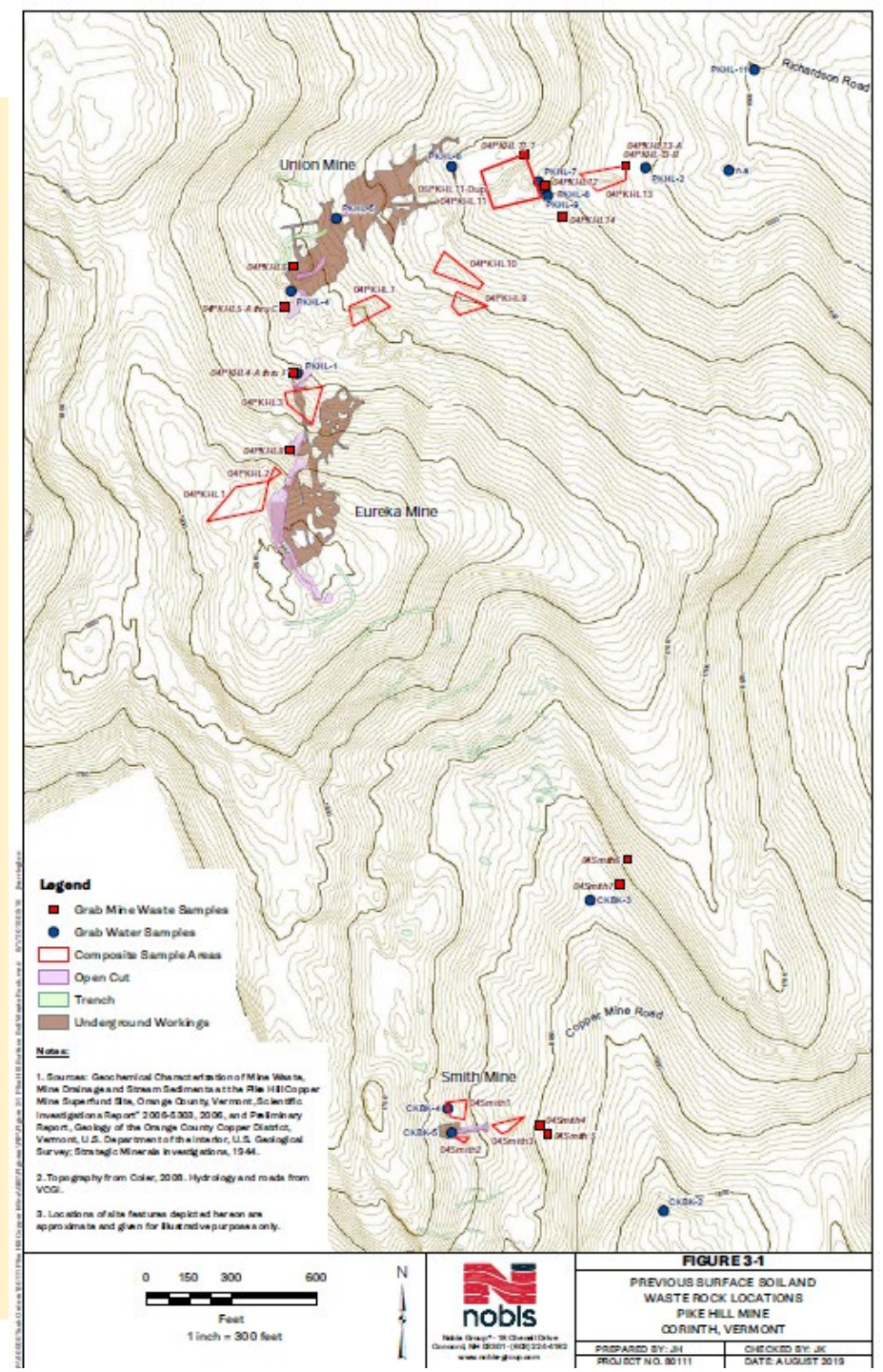
- The National Priorities List (NPL) listing describes the size of the Site as 216 acres. The exact dimensions to be determined during the RI/FS.
- The Eureka and Union mines are generally considered to be a single-impacted landscape within the Pike Hill Brook watershed containing a barren area of waste rock, tailings piles, open mine cuts, trenches, and mine shafts and adits (some collapsed).
- The Eureka and Union mines are part of one 183-acre property that is privately owned by a forest conservation company.
- The Smith Mine is about 0.5 miles south of the other mines. It consists of three small mine waste piles and a collapsed adit and shaft that lie within the Cookville Brook watershed.
- The Smith Mine is part of a separate 100-acre parcel that is privately owned.





# Pike Hill Copper Mine

- The Eureka and Union mines waste areas extend over about 20- 30 acres based on the current delineation of the waste, which will be revised based as site investigations provide more information.
- The Smith Mine waste areas extend over about 3 acres based on the current delineation of the waste, which will likely be revised based on additional site investigations.
- Estimates for the waste rock volume for the entire Site range from 20,000 cubic yards to 50,000 cubic yards of waste rock and tailings piles based on the current delineation of the waste. This volume is likely to increase as additional investigations are performed.
- Based on studies performed by the United States Geological Survey (USGS), the ore deposit at the Pike Hill Copper Mine is very similar to the deposit at the Elizabeth Mine and Ely Mine with respect to mineralogy and physical characteristics.



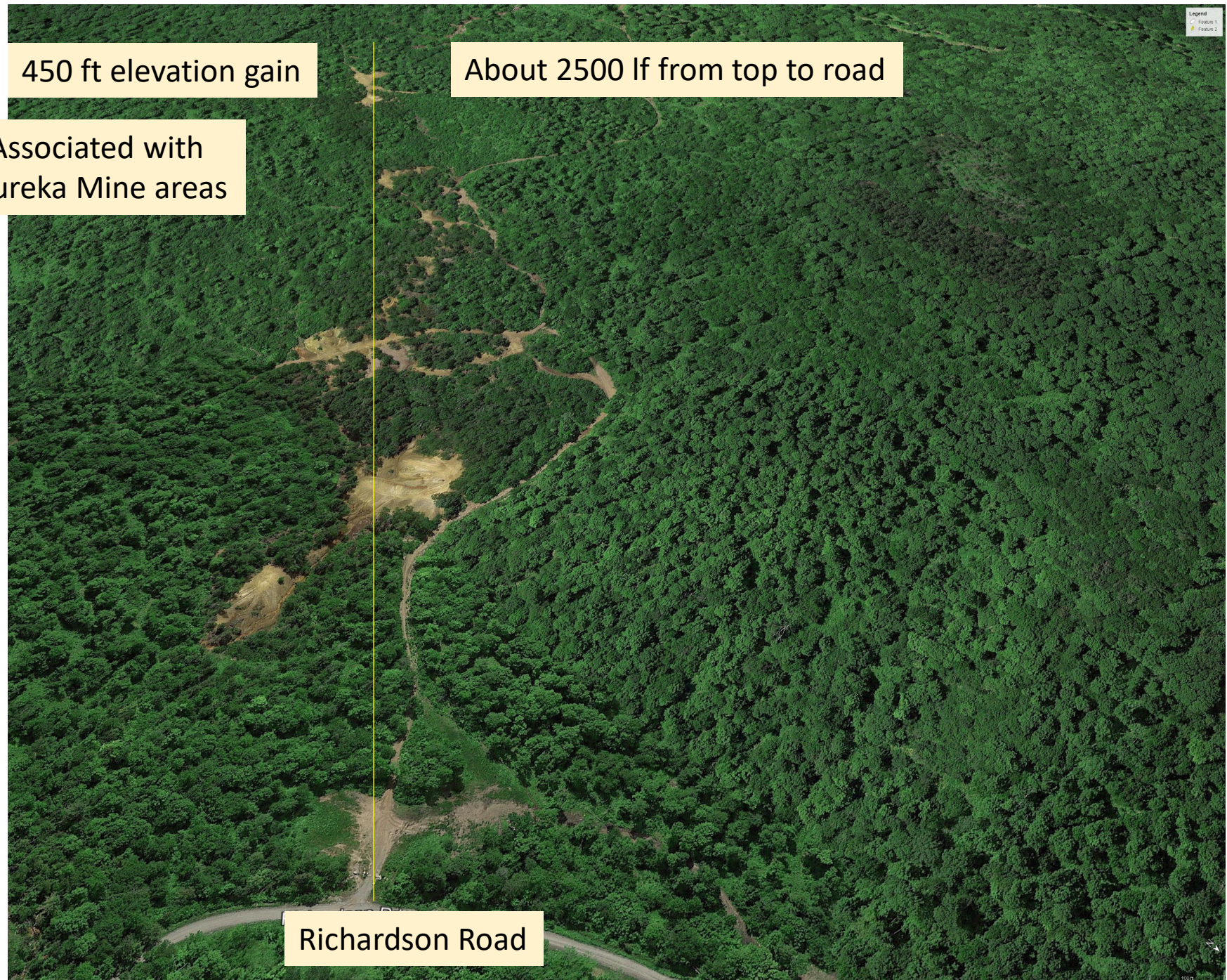


450 ft elevation gain

About 2500 lf from top to road

Waste Piles Associated with  
Union and Eureka Mine areas

Richardson Road





## Waste Piles Associated with Union and Eureka Mine areas





Weathering of waste rocks forms water-soluble efflorescent salts





Aluminum precipitate forms in groundwater seep near Smith mine





# Pike Hill Copper Mine

- Current Site Status:
- Completed work:
  - Waste characterization to confirm waste material is similar to waste at Elizabeth Mine and Ely Copper Mine
  - Aquatic ecological assessment that evaluated:
    - Surface water and sediment toxicity testing
    - Benthic and fish community richness and abundance surveys
    - Surface water and sediment data used to develop hazard quotients
    - Fish tissue sampling
  - Site topographical surveys have been completed.
  - RI Work Plan to address remaining data gaps has been developed.
  - Conceptual Site Model Report completed.
  - Initial Failure Modes and Effects Analysis (FMEA) for Underground Workings completed.
  - Several USGS reports documenting surface water flow, chemistry, geochemistry of waste, and summarizing ecological investigations.
  - Remedial Investigation and Feasibility Study will re-start in 2022.
  - Surface water and soil samples collected in 2021 to document that site conditions have not changed substantially since initial characterization.
- Remaining investigation work:
  - Groundwater characterization.
  - Terrestrial eco characterization.
  - Wetland characterization.
  - Preparation of major reports (RI, HHRA, BERA, FS).
  - Operable Units are likely to address Underground Workings; Groundwater, and downstream sediments and wetlands.



## Current Site Status

- Work Planned for 2022:

- EPA is developing an Engineering Evaluation and Cost Analysis (EE/CA) to identify cleanup actions that can be implemented to address the most significant sources of contamination.
- The EE/CA should be completed in May/June 2022.
- A fact sheet summarizing the EE/CA and presenting the recommended cleanup approach will be developed and provided to the community in summer 2022.
- The EE/CA, fact sheet, and other supporting documents will be subject to a public comment period, typically 30 days in duration.
- After EPA reviews and considers all of the comments received, an Action Memorandum will be developed to document the cleanup approach.
- Following the Action Memorandum, the next step would be to develop a detailed design for the cleanup. The design step could require 1-2 years.
- Once the design is completed, EPA would then need to procure a contractor to perform the cleanup work. The actual cleanup work may not begin until 2024/2025.



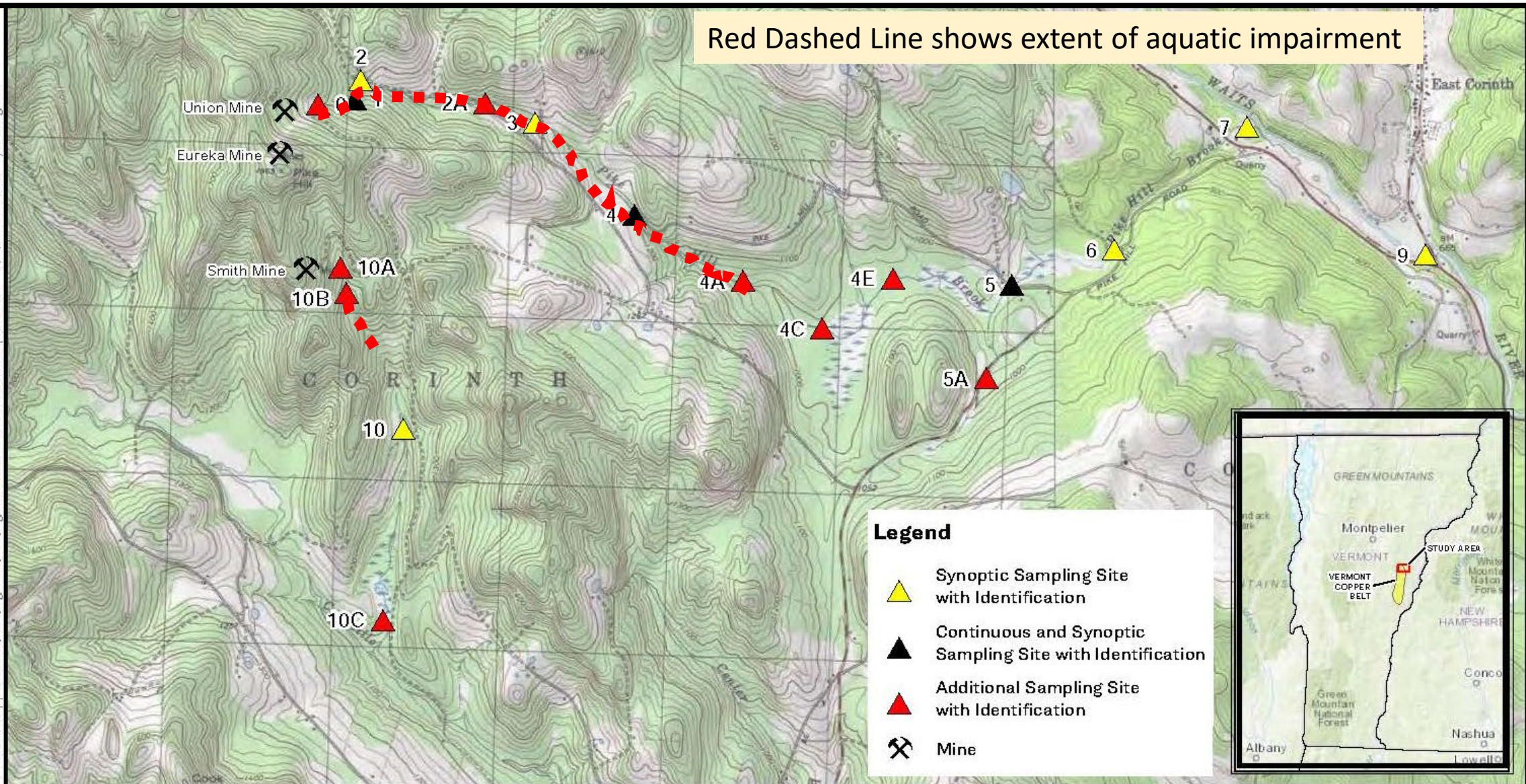
## Characteristics of Mine Pike Hill Mine Waste

- The contaminant sources at the Pike Hill Copper Mine include:
  - Mine-waste including oxidized and unoxidized sulfidic ore and waste rock, and flotation-mill tailings.
    - Based on past testing, the leachate from the waste piles and tailings is the major source of metals in Pike Hill Brook and the tributary to Cookville Brook.
    - The major non-sulfur constituents of significance are cadmium, cobalt, copper, iron, and zinc.
  - Discharge from the Underground Workings through seeps and Adit discharge could also be contributing to the stream impacts.
  - Downstream sediments are being contaminated through physical transport of mine waste and precipitation of dissolved metals.
  - Downstream wetlands are a sink for the dissolved metal contaminants in surface water and the eroded sediments.



Red Dashed Line shows extent of aquatic impairment

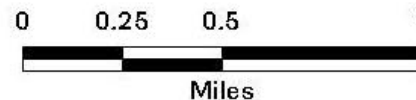
F:\80000 Task Orders\80111 Pike Hill Copper Mine\GIS\Figures\FIP\Figure 3-3 Pike Hill Water Samples.mxd 8/2/2019 07:52 jharrington



**Notes:**

1. This figure was developed from information found within the "USGS Surface-Water Hydrology and Quality at the Pike Hill Superfund Site, Corinth, Vermont, October 2004 to December 2005 Scientific Investigations Report 2007-5003."

2. Base from US Geological Survey, West Topsham, 1981 and East Corinth, 1973.



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**FIGURE 3-3**

**WATER SAMPLING SITE LOCATIONS  
PIKE HILL COPPER MINE  
SUPERFUND SITE  
CORINTH, VERMONT**

PREPARED BY: JH

CHECKED BY: JK

PROJECT NO. 80111

DATE: AUGUST 2019



## Pike Hill Copper Mine

### Risk Evaluation Summary:

- The discharge from the Pike Hill Mine Superfund Site is causing acute toxicity (100% mortality) in surface water toxicity tests performed in surface water in the tributary from the Pike Hill Mine Superfund Site that drains into Pike Hill Brook and in Pike Hill Brook after the confluence with the discharge from the Pike Hill Mine Superfund Site.
- Copper concentrations in the water of the tributary to Pike Hill Brook and in Pike Hill Brook after the confluence with the discharge from the Pike Hill Mine Superfund Site exceed Vermont Water Quality numerical standards and federal Clean Water Act National Recommended Water Quality Criteria.
- The benthic community and fish community of Pike Hill Brook are severely impaired by the release from the Pike Hill Superfund Site for several miles below the confluence of the water from the Pike Hill Mine Superfund Site with Pike Hill Brook.



## Pike Hill Copper Mine

- **Why a Non-Time Critical Removal Action (NTCRA):**
  - Site represents a severe ongoing ecological threat as documented by multiple lines of evidence (surface water concentrations, benthic community studies, fish community studies, and toxicity testing).
  - Targeted source control action would greatly reduce acute impacts and reduce loading to downstream wetland area while the ongoing investigation and assessment of response options, known as a Remedial Investigation/Feasibility Study (RI/FS) related to the groundwater, the underground workings, and downstream waters (wetlands and streams) are being completed.
  - This approach was successful at Elizabeth Mine
  - Several more years to complete RI/FS and sign a Record of Decision (ROD), which documents EPA decision on the proposed remedy or remedies and the reasons for selecting this approach



## Pike Hill Copper Mine

- Cleanup Objectives for NTCRA:
  - Isolate mine waste from water and oxygen to minimize the migration of contamination into Pike Hill Brook and a tributary of Cookville Brook.
  - Limit tree clearing and other disturbance to minimize impact on the habitat, including the hibernacula, for federal and state threatened and endangered bats.
- Cleanup levels would be VT Water Quality Standards and federal National Recommended Water Quality Criteria, as measures in stream downgradient of Waste Management Area.

## Pike Hill Copper Mine

Based on experience from Elizabeth Mine and Ely Copper Mine, the most likely alternatives to be developed in the EE/CA for the NTCRA include:

1. On site consolidation and capping of mine waste material, including Smith Mine piles.
2. Partial on-site consolidation and capping of mine waste material, including Smith Mine piles with in-situ covering of waste in proximity to the Bat Hibernacula that cannot be removed without disturbing the tree cover or other critical criteria.
3. Off-site disposal of mine waste material.
4. Passive treatment of Adit seeps and other seeps.



# Pike Hill Copper Mine

Technical documents for Pike Hill Copper Mine Superfund website: [www.epa.gov/superfund/pikehill](http://www.epa.gov/superfund/pikehill)

- Nobis, 2019. Draft Remedial Investigation Field Investigation Plan, Pike Hill Copper Mine Superfund Site Operable Unit 01, Corinth, Vermont. July.
- SLR, 2019. Failure Modes and Effects Analysis at Pike Hill Copper Mines Superfund Site. August..
- Piatak et al. 2012. Aquatic Assessment of the Pike Hill Copper Mine Superfund Site, Corinth, Vermont. USGS Scientific Investigations Report 2012-5288.
- PAL, 2011. Final Report, Historic/Archaeological Mapping and Testing, Pike Hill Mines Site. February 2011.
- Nobis, 2008. Draft Conceptual Site Model Technical Memorandum. Pike Hill Copper Mine Site, Corinth, Vermont. June.
- Kiah et al, 2007. Surface-Water Hydrology and Quality at the Pike Hill Superfund Site, Corinth, Vermont, October 2004 to December 2005. USGS Scientific Investigations Report 2007- 5003.
- Piatak et al., 2007a. Geochemical Characterization of Mine Waste, Mine Drainage, and Stream Sediments at the Pike Hill Copper Mine Superfund Site, Orange County, Vermont. USGS Scientific Investigations Report 2006-5303.
- Piatak et. al., 2007b. Sequential Extraction Results and Mineralogy of Mine Wastes and Stream Sediments Associated with Metal Mines in Vermont, Maine and New Zealand. USGS Open-File Report 07-1063.
- USGS, 2007. Surface-Water Hydrology and Quality at the Pike Hill Superfund Site, Corinth, Vermont.

# Pike Hill Mine Superfund Site

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